CONSTRUCTED WETLAND
CONSTRUCTION SPECIFICATION

1. SCOPE

The work shall consist of furnishing materials and installing all components of the constructed wetland as outlined in this specification and the drawings.

Construction work covered by this specification shall not be performed between December 1 and the following March 15 unless the site conditions and/or construction methods to be used have been reviewed and approved by the Engineer.

2. MATERIALS

a. DRAINFILL AGGREGATE shall meet the requirements of Penn DOT Specifications, Section 703.2, Type A, Coarse Aggregate. The size and gradation shall be as specified in Section 10 or on the drawings.

b. FLEXIBLE MEMBRANE LINERS shall meet the requirements of Specification 521A.

c. PIPE shall meet the requirements specified in Section 10 or on the drawings.

d. WOOD shall be graded and stamped by an agency accredited by the American Lumber Standards Committee as meeting the required species, grade, and moisture content. In the absence of such a stamp, the Contractor or material supplier shall provide written certification that the wood products meet the designated quality criteria.

e. PRESSURE TREATED WOOD PRODUCTS shall be Douglas Fir, Southern Yellow Pine, or as otherwise specified on the drawings or in Section 10. They shall be treated with preservatives in accordance with the American Wood Preservers Association (AWPA) Standard C16, “Wood Used on Farms, Pressure Treatment.” Each piece shall bear the AWPA stamp of quality. In the absence of such a stamp, the Contractor or material supplier shall provide written certification that the pressure treated wood products meet the designated quality criteria.

f. FASTENERS for wood structures shall be stainless steel, galvanized, or otherwise protected from corrosion due to contact with moisture, manure and associated gasses.

3. SITE PREPARATION

All trees, brush, fences, and rubbish shall be cleared within the area of the constructed wetland, including any embankments or appurtenances, and any borrow areas. All stumps, roots and rubbish shall be removed from these areas to a depth of at least six inches below the existing ground surface. All material removed by the clearing and grubbing operation shall be disposed of as directed by the Owner or his/her Representative.

Sufficient topsoil is to be stockpiled in a convenient location for use on the embankment, other disturbed areas, and the bottom of wetland cells unless otherwise directed in Section 10 or on the drawings.

4. CORE TRENCH

Where specified, a core trench shall be excavated along or parallel to the centerline of the embankment, as shown on the drawings. The width of the trench shall be governed by the equipment used for excavation and backfill, with the minimum bottom width being four feet.

If a core trench is specified, the minimum depth shall be two feet or the depth shown on the drawings. If large boulders or bedrock is encountered in the excavation, the minimum depth will not be required if, in the opinion of the Engineer, the trench cannot be excavated to the required depth. The bedrock or boulders shall be cleared of all loose materials to insure adequate compaction of backfill material to the rock. The side slopes of the trench shall be one-on-one or flatter, or as otherwise shown on the drawings.

The backfill material for the core trench shall be the most impervious material available on site and shall be compacted as set forth in Section 6 for embankment fill. Where bedrock is encountered, the fill material shall be placed in three-inch layers and compacted by hand or mechanical tampers. Back-filling shall continue in three-inch layers until the depth of fill over the rock is such that acceptable density may be obtained by using construction equipment with a maximum of six-inch layers for the compaction operation.

5. PIPES

Excavation for pipes shall be made to the grades and lines shown on the drawings or as indicated by construction stakes. Care should be taken not to excavate below the depths specified. Excavation below grade shall be corrected by placing firmly compacted layers of moist earth to provide a good foundation. If rock or boulders are exposed in the bottom of the excavation, they shall be removed to a minimum depth of eight inches below the invert grade of the pipe and any appurtenances, and replaced with firmly compacted earth to the specified grade.

Pipes shall be backfilled in horizontal lifts of moist earth not to exceed four inches in thickness, or with other material as specified in Section 10 or in the drawings. Each lift shall be compacted by hand tampers or other compaction equipment, however at no time shall driven equipment tires or tracks be within two feet of pipes or appurtenances.

All pipe inlets and outlets within the storage pond shall be installed with a watertight seal around the pipes to prevent migration of contaminated liquids along the pipe.

6. EMBANKMENT

The fill material for the embankment shall be obtained from within the required excavation or the designated borrow area(s) as specified in Section 10 or in the drawings. The material shall be free from stumps, wood, brush, roots, sod, rubbish, and other matter that may decay. It should also be free of stones over two inches in diameter where compacted by hand or mechanical tampers, or over six inches in diameter where compacted by rollers or other driven equipment. Frozen material shall not be placed in the fill nor shall the fill material be placed on a frozen foundation.

Prior to placing the fill material on any portion of the foundation, that portion shall be scarified, plowed, or disked to a depth of three inches. All objectionable material, i.e., other than the mineral soil that has been identified for use as fill, exposed by this operation shall be disposed of as directed by the Owner.

The placing and spreading of fill material shall be started at the lowest part of the section under construction and carried up in layers of six inches. The layers shall slope slightly towards the outside of the embankment to prevent puddles and provide for faster runoff in case of rain. Where possible, the layers should extend over the entire area of the fill. The distribution and gradation of the materials throughout the fill shall be such that there are no lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surrounding material. The most porous borrow material shall be

placed on the outside portions of the embankment.

Each layer of fill material shall be compacted by routing the construction equipment so that all parts of each layer are equally compacted. Each layer shall receive at least three passes of a sheepsfoot roller or five passes of a loaded carryall, unless otherwise specified in Section 10 or on the drawings. Fill material should contain sufficient moisture so that it can be formed into a ball without crumbling. If water can be squeezed out of the ball, it is too wet to compact properly.

7. LININGS

A. FOUNDATION PREPARATION.

The bottom of the wetland shall be excavated to the designated subgrade and be inspected by the Engineer before work proceeds. All exposed rock surfaces will be cleaned for inspection. Open joints, fractures, solution channels, pockets of coarse material, and groundwater seeps will be brought to the attention of the Engineer. Open bedrock conditions shall be treated as specified in Section 10 or in the drawings. Coarse material and wet foundation conditions shall be over excavated and replaced with at least one foot of compacted soil as directed by the Engineer. Fill shall be placed as described in Section 6 unless otherwise specified in Section 10 or on the drawings.

The subgrade shall be free of debris, organic matter, free water, ice, snow, or other harmful substances. Placement of linings on mud, uncompacted fill or frozen material will not be permitted. The subgrade shall be moist and dampened with water, if necessary. The surface of the subgrade shall be scarified to a depth of three inches prior to placement of liner material or fill. If a liner other than soil is to be used, the surface of the scarified subgrade shall be compacted with at least 3 passes of a smooth wheeled roller.

In addition to uniformity, the existing subgrade material must have sufficient strength to support the lining and its associated loads. Geosynthetics may be used, if approved by the Engineer, to further separate and/or stabilize the foundation. Subsurface drainage may also be used to stabilize localized soft areas, however extra care will have to be taken to isolate the drain from the wetland cell, as directed by the Engineer.

Linings shall not be placed until the subgrade has been inspected and approved by the designated inspector. Notification shall be given far enough in advance to provide time to schedule the inspection.

B. CLAY LINERS

The clay liner shall consist of the material designated in Section 10 or in the drawings, and shall be placed as described in Section 6, to the compactive effort and with the moisture content designated in Section 10.

E. OTHER LINERS

Other liners, e.g. flexible membrane, shall be installed in accordance with Specification 521A.

8. TOPSOIL PLACEMENT

Topsoil stockpiled on the site shall be used to fill the bottom of the wetland cells. The topsoil shall not be placed in the wetland until the liner has been inspected and approved. Topsoil shall be placed to the depth specified in Section 10 or on the drawings. Equipment operation shall be controlled to minimize compaction of the topsoil, and to prevent damage to the liner. Care shall be taken to finish the top of the soil to the grades shown on the drawings.

9. VEGETATION ESTABLISHMENT

The wetland cells shall be pre-wetted with fresh (non-waste) water so that the topsoil is

thoroughly moist, but not saturated or flooded with standing water.

Planting shall take place immediately after the soil in pre-wetted. Plant sources, types, spacing and planting method shall be as specified in Section 10 or on the drawings.

The topsoil shall be kept moist to saturated with fresh water, but without standing water, until 75% of the plants show new growth.

Wastewater can then be introduced, but the water level shall not exceed ½ the shortest plant height. Water levels shall be gradually increased to the normal operating level(s).

10. ADDITIONAL CONDITIONS WHICH APPLY TO THIS PROJECT ARE: